

THE BEES CAME ON US like a squall. At first we felt only the warning—the pelting of a few sentinels against our protective veils. Then, as we drew closer to their hives in the equatorial Brazilian bush, the torrent broke. The buzzing of countless wings filled the air.

The bees seemed possessed by rage. I grew queasy watching them swarm over my bee suit, embedding their stingers in the heavy canvas. Each was giving its life in defense of its hive, for a honeybee soon dies after losing its stinger.

Inches from my eyes, frenzied bees clung to my veil and pumped their barbed abdomens at me through the netting. So many bees attacked National Geographic photographer Bianca Lavies's cameras that she could not press a shutter release without squashing some (left). Our guide, beekeeper Antônio Both, fled as bees stung through his suit. I felt a stinger pierce my glove and had to fight my own urge to run.

We had met the full fury of the Brazilian bee, the phenomenal product of a bee-breeding accident. Twenty-six queens of a notoriously ferocious race of honeybee from Africa, *Apis mellifera adansonii*, escaped in 1957 from the site of a genetics experiment near São Paulo. Honeybees are not native to the Americas, but over the years Brazilians living in the temperate south had imported gentler European bees. The Africans quickly intermixed with them and procreated a fierce new race.

Since then the African hybrids have spread throughout much of South America. Now advancing northward about two hundred miles a year, Brazilian bees threaten to invade Central America, and then Mexico, and ultimately the United States. Bee attacks as violent as the one Bianca and I experienced are isolated incidents. Yet at least 150 people and countless animals in Brazil have died in such encounters.

The story begins ages ago, scientists speculate, as honeybees migrated westward from Asia into Europe and Africa, where they met different destinies. Southern Europe's mild climate and, later, man's beekeeping practices, fostered the gentler strains.

The bees that pushed south into Africa, however, had to struggle with a much harsher environment, hotter and drier. They remained nomads, an entire colony following the

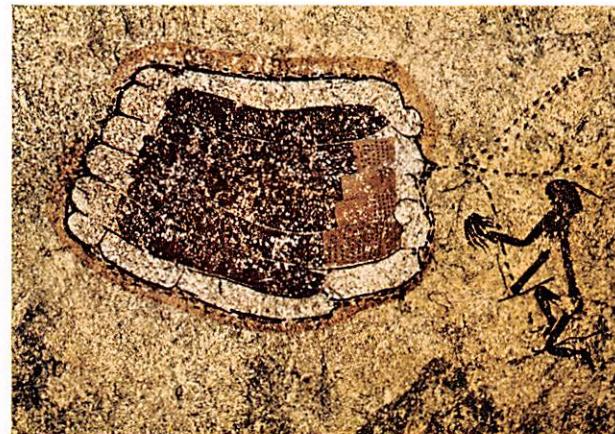
Those Fiery Brazilian Bees

By RICK GORE

Photographs by

BIANCA LAVIES

BOTH NATIONAL GEOGRAPHIC STAFF



RICK GORE (FACING PAGE) AND HAROLD L. PAGER

Frenzied horde near Belém bombs the protective suit of photographer Lavies. In 1957 fierce African bees, imported to Brazil for controlled breeding, escaped and mated with resident honeybees. The Africanized offspring, sometimes lethally aggressive, now move slowly northward. A rock painting in Rhodesia (above) depicts a Stone Age man using a torch to rob a hive, a destructive practice that may help explain the belligerency of the African bees.

flowers and nesting in a crevice or in the hollow of a baobab tree. Their honey drew predators, including man, that destroyed the colonies they robbed. Only the most unapproachable colonies were likely to survive.

The African honeybees developed into a nervous, easily provoked race. They have a marked ability to communicate alarm by releasing chemical secretions called pheromones. The odor often triggers an explosive response throughout the colony. African bees are no more venomous than others; they simply sting in larger numbers, and a few hundred stings are enough to kill anyone unable to outrun the bees.

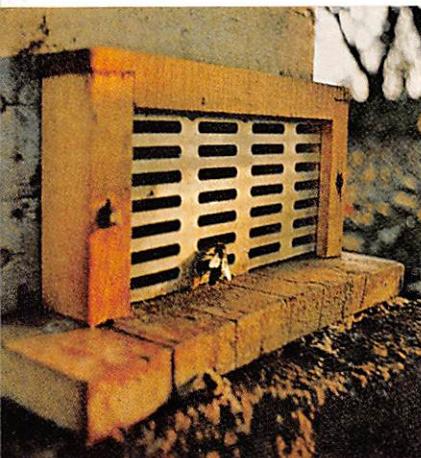
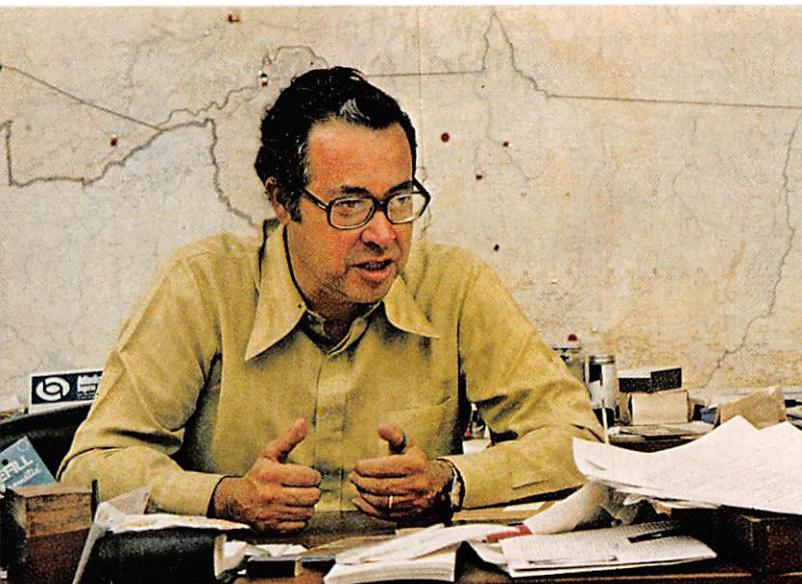
Although highly aggressive, the Africanized bees possess one outstanding virtue: They produce large amounts of honey. On

their native continent the bees developed into industrious workers, able to store enough honey during the flowering seasons to help support them in times of drought.

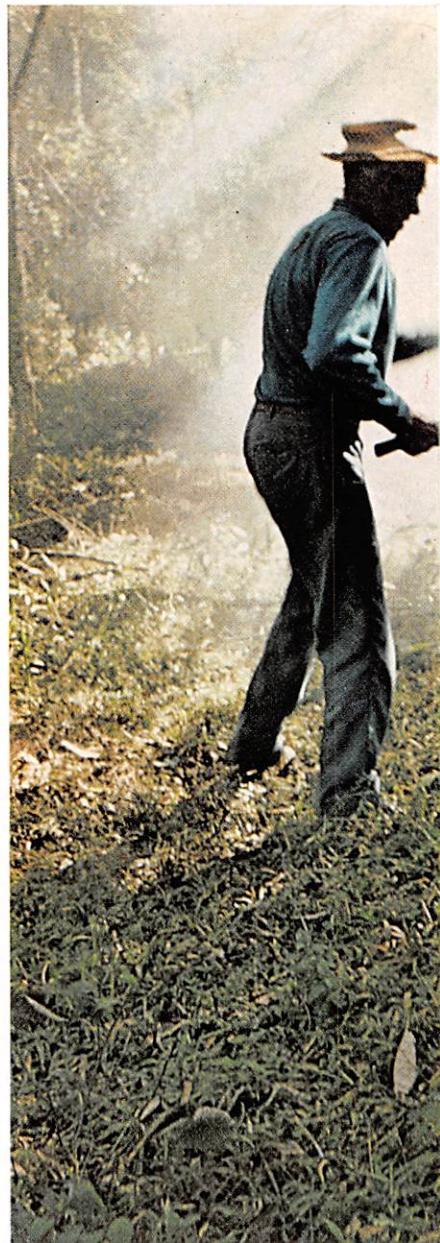
The Brazilian Government had asked University of São Paulo geneticist Warwick Estevam Kerr (below) to improve the output of European honeybees, which had never produced well in tropical areas of Brazil. So in 1956 Kerr placed 35 African queens in an isolated apiary in the State of São Paulo, for use in breeding experiments.

"We knew they were fierce," recalled Kerr, now director of the National Institute for Amazon Research in Manaus. "Every precaution was taken to prevent their escape."

Kerr placed grids over each hive with slots large enough for worker bees to squeeze



Subdued by smoke, Brazilian bees remain quiescent as brush is cleared from around their hives. Geneticist Warwick E. Kerr (above) imported high-strung but hardworking African bees to boost honey yields. Grids on their hives in the State of São Paulo (left) kept queen bees imprisoned while permitting the smaller workers to come and go. Removal of the devices by an uninformed beekeeper allowed 26 African queens to fly free.



through but too small for the queen and drones. These devices keep the drones inside and also prevent the queens from swarming with an entourage of worker bees to establish new colonies of their own.

Swarming is the way all honeybees reproduce their colonies. By nature, African bees swarm frequently. Before an old queen and her swarm leave, the colony begins to feed a royal jelly to selected larvae, which will then develop into new queens. The first or strongest new queen kills her competitors and soon flies off to mate with drones from her own or nearby colonies.

Unfortunately a beekeeper visiting the secluded apiary did not know Kerr's bees were dangerous and removed the devices. By the time Kerr discovered what had happened, 26

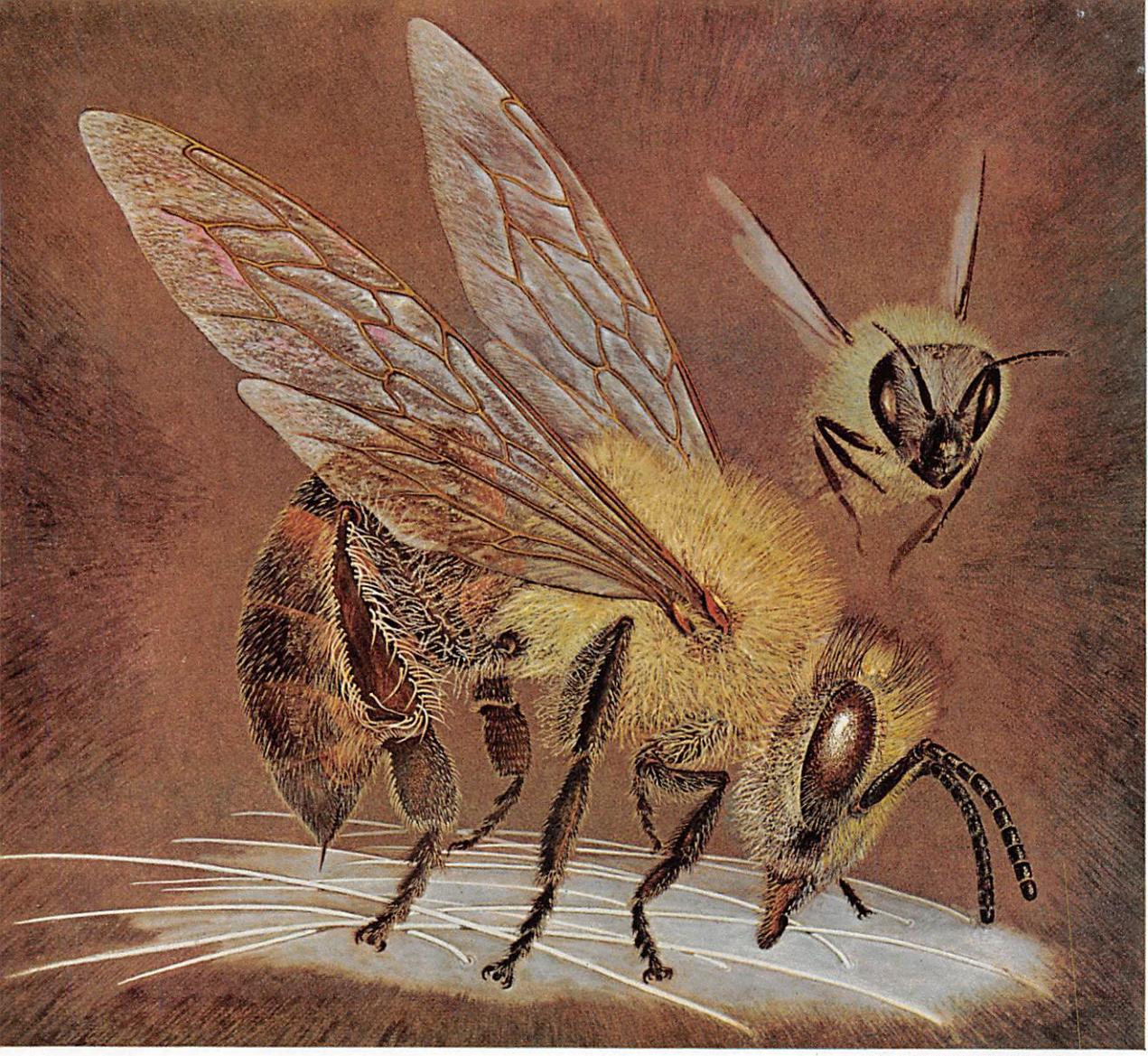
queens had flown with swarms into the bush.

As the aggressive Africans spread out, their drones began to cross with the local European queens, outcompeting the domestic drones on mating flights. At that time many people in the south of Brazil kept hives near their houses. Suddenly these families found their bees turning vicious, stinging children, killing cows. African invaders also swooped in to rob the European bees of their honey, or, often, to kill a colony and take over its hive.

The Africans drove most beekeepers out of business. As one man put it, "Horrible things began to happen." At times bees terrorized towns, forcing residents indoors.

Choked with emotion, Lazaro de Godoy of Águas de Lindóia told me that he had found the body of a friend with a thousand stings on





PAINTING BY SUZAN SWAIN FIRMAGE

his head. He had shot himself in his agony.

"I thank God I'm not dead," said Joaquim da Silva, 74, of the same town. Five years ago a swarm of bees collided with him and his horse along a highway. The horse went wild, throwing da Silva to the ground and breaking his leg. Luckily for him, the bees pursued the horse; it died three days later.

African Strain Braves the Dry North

Honeybees were virtually unknown in the hot, arid northeast of Brazil until the Africanized bees arrived about nine years ago.

"It's incredible how many bees we have in the bush now," a farmer complained to Bianca and me in Ceará, a northern state.

"Bees have killed 18 people in this state," a ministry of agriculture aide told us. "Many

more have been attacked. How many animals have they killed? Surely thousands. This falls hard on our poor people."

In July of 1975 bees killed a teacher in the city of Aracaju. There I learned the details.

A bee stung Dr. Eglantina Portugal as she arrived at school. She slapped it, and the bee apparently released its alarm odor; swarms in nearby trees responded.

"Suddenly hundreds, thousands of bees appeared," a witness told me. "Dr. Eglantina ran, but she had a lame leg. She tripped and fell into a ditch. She crawled out. I could see many bees on her face and neck. More bees were coming all the time."

"I wanted to help, but it was impossible to leave my closed car; bees were all over it. Some people from nearby houses arrived with

San Francisco
CALIFORNIA
UNITED STATES

Pacific
Ocean

TEXAS
Charleston

Gulf of Mexico

MEXICO

Nearly identical in appearance to gentler honeybees of European origin, the African bees quickly dominate hives of the less aggressive strains. Although a sting from the new hybrids (left) injects about the same amount of poison, the insects' excitability provokes mass attacks that have proved fatal to at least 150 Brazilians and innumerable animals. Swarming across South America (map, right), Africanized bees advance at a pace that could put them in the United States within two decades. Crossbreeding might offer the best solution. To dilute aggressive traits, sperm from a European drone is injected into an African queen at a laboratory in Ribeirão Preto (below).



water, but the bees stung them and drove them back. Finally firemen arrived, but they, too, ran away with bees all over them. They returned waving smoking torches and were able to get Dr. Eglantina to the hospital. But it was too late."

During the swarming that follows the annual rains, bee incidents are common, especially in the country. City people have learned to call the *bombeiros*, or firemen, to kill invading swarms. "We may get 20 calls a day," a Fortaleza bombeiro told me.

Soccer games are sometimes interrupted by swarms of bees that settle in the stadium. When the crowd begins to stomp and shout, agitated insects attack the spectators.

In the Amazonian delta town of Soure, a jubilant celebrant in a procession honoring

Africanized bees could survive winter temperatures at least as far north as the dashed line. Red arrows trace the bees' possible routes through Central America.



In the south the bees are approaching their probable low-temperature limit, shown here by the dashed line. The high cold wall of the Andes has long spared South America's west coast, but recently the bees have been reported in Santiago.

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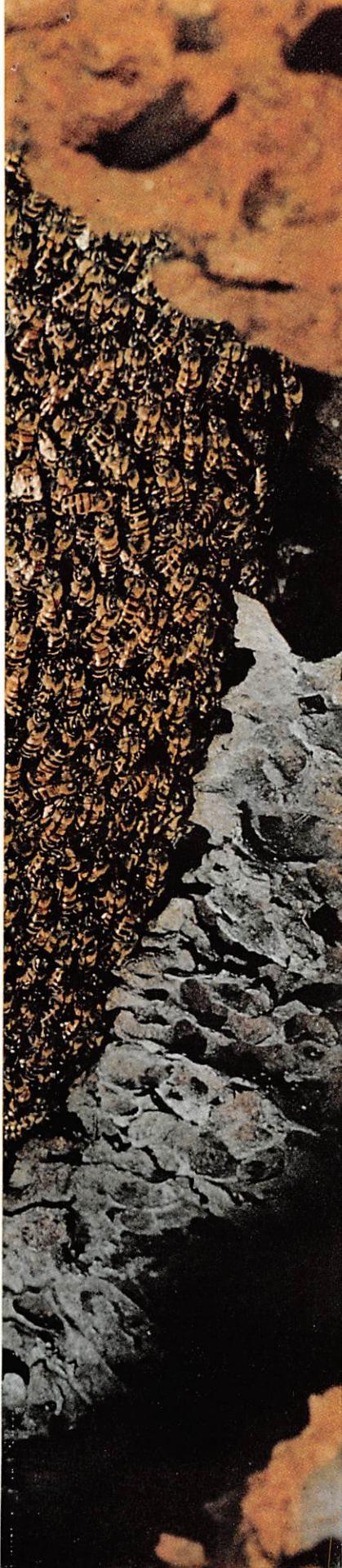
the local patron saint fired a pistol into the air. The shot excited a swarm in the trees. The bees descended. End of procession.

In Rio Grande do Norte, drivers of sugar-cane cutting machines now wear bee veils. Syrup from cut stalks draws bees, which become frenzied by the rumbling vehicles.

"I was plowing with my tractor," Natanael Soares Fereira told us near Goianinha. "I must have driven over a nest. I felt a few stings on my leg. I looked behind me; the sky was dark with bees. God gave me legs to run, and I used them that day. I let my machine run free, and the bees chased it. It was hours before I could return to it."

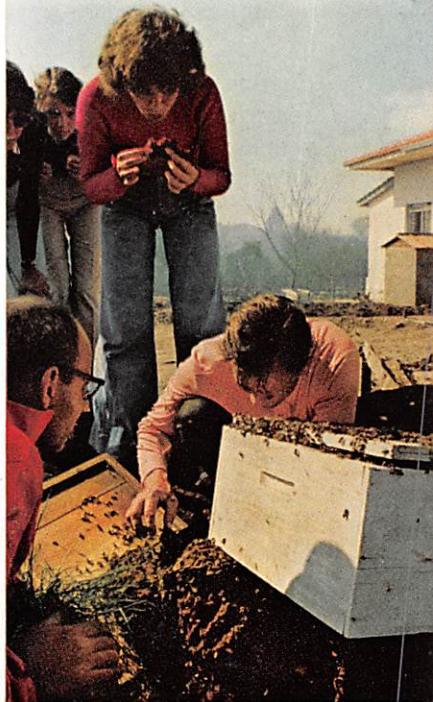
Professor Paulo Mesquita, who teaches agricultural technology in Natal, said that two local men had been killed recently while





Bee bomb hangs from the wall of a termite nest (left) that has been opened to remove the unwelcome invaders. Tranquilized by smoke and cold, the Africanized swarm allows bee specialist Paulo Sommer to search for the queen (right). Her transfer to a box hive and removal from the area will draw away workers and drones, to the relief of a Brazilian family living nearby. Workers surround the larger body of the queen (below), who has slightly broader stripes than her courtiers.

Supreme matriarch of bee society, the queen is fertilized only at one time during her entire egg-laying life, which may extend over several years. During the



flight when mating takes place in midair, the most zealous six or seven among hundreds of competing males usually reach her first, thus passing on their characteristics to offspring.

Three bees planted their painful stingers in the cheek of photographer Lavies (right) when a fold in her bee-covered veil touched her face.



RICK GORE (ABOVE)

clearing land. "We protect our people with heavy suits and veils. But it is so hot, the people take them off. This is how they are killed. Bees make land clearing expensive. The workers demand more money."

Honey Hunters' Defense: Alcohol

Oddly, the African bee has brought to northern Brazil one of the most primitive forms of livelihood: A number of peasants have become *meleiros*—wild-honey hunters.

Francisco Soares da Costa (page 500) lives in grim poverty with at least a dozen children and grandchildren in a mud hut near Aracati. He explained how, during the four-month honey season, he uses smoke to chase the bees away from their nests long enough for him to extract their honey. Often *meleiros* begin their day by drinking. Alcohol, they allege, counteracts the forty or more stings they receive going after a colony.

"Sometimes my husband comes home stung so badly he has fever all night," Francisco's wife, María, told me.

For his efforts Francisco harvests some 130 gallons of honey a season. He can sell that for about 100 dollars—most of his income for the year. Francisco's hardships so moved Bianca that as soon as she returned from Brazil she sent him a bee suit.

As the wild bees have moved northward, the perils have subsided in southern Brazil, where stories of terror and stinging death are

now largely memories. Commercial beekeepers have moved their hives far from populous areas. Many wild colonies have been eradicated. And, as the Africanized bee has continued to cross with the European, the former has grown markedly less aggressive. The cooler climate, also, may have helped tone down its temper.

Many beekeepers now praise the very bee they cursed five years ago. They have discovered that some African genes are good for honey production.

"The Africanized bee is the only one I want now," said Dr. Paulo Sommer, president of the Beekeepers' Association of Paraná. "It gives me twice as much honey."

Thus the Africanized bee promises to become a new resource not only for Brazil, but also for many lean and hungry lands throughout the tropical and subtropical world.

But it can still be aggressive. The beekeepers usually wear bee suits and veils now and practice continual genetic selection. Whenever a hive becomes overly aggressive, the beekeeper replaces its queen with a gentler one. The apiary queens often mate with Africanized drones from the bush, and after several generations the African traits frequently build up too strongly.

Africanized bees are physically almost identical to European bees, yet even my untrained eye could tell that the bees in Dr. Sommer's apiary, like all bees in Brazil

Flower-bright boulder proclaims a "City of the Bees" (right), a Brazilian apicultural center near south-coast Florianópolis designed to encourage beekeeping. In northern Brazil a veiled and canvas-covered doll used in teaching bee-protection techniques intrigues a young visitor (left). Despite inconvenience in handling high-strung swarms, apiarists recognize the higher honey output of Africanized bees. They sometimes double the amount made by European strains. Hives at the bees' point of origin in southern Brazil become gentler with succeeding generations, a possible effect of the crossbreeding programs that eliminate the fiercest swarms. Barriers of cold in the United States may halt the northward spread of the easily provoked insects; Africanized bees winter poorly in low temperatures.



today, varied widely in behavior. Some hives seemed to ignore us, while defenders from others boiled out at us, braving heavy doses of smoke.

Interestingly, none of the bees actually stung us. Dr. Sommer explained that because it was winter in Paraná, the colonies were small; presumably the workers would not sacrifice themselves unless seriously provoked. "Come back when it is warm and the hives are strong and full of brood and honey," he said. "You'll see some aggressive bees."

Feisty Insects Heading Northward

We left Dr. Sommer and flew north to neighboring French Guiana to meet with University of Kansas entomologist Orley Taylor, who is studying the bees' advance for the United States Department of Agriculture. The front line, Dr. Taylor said, has reached Surinam (map, page 495). And with few European strains in this region to dilute the genes, the bees seem almost pure Africans.

They are moving slowly now, however—probably because the dense forests and heavy rains of the Guiana region create poor conditions for forage.

"Within two years they should reach the more hospitable terrain of Venezuela," Dr. Taylor said. "I think they will build up large populations there and move rapidly, reaching Panama in about seven years. Then it will probably be clear sailing through Mexico."

The best current estimate would place the African bees' arrival in the United States somewhere in the early 1990's. However, imponderables such as unexpected predators or diseases could slow their march.

On the other hand, warns Dr. Taylor, "We can't discount that someone, say a misguided beekeeper in Mexico or the United States, might sneak some in because they are such good honey producers in warmer areas."

Most U. S. experts are counting on Mexico, which has a large European-bee industry, to tone down the invaders genetically. "We hope that whatever forces operated on the bees in southern Brazil will operate on them in Mexico," explained Dr. Charles D. Michener, University of Kansas entomologist.

Some scientists favor creating a genetic barrier by releasing droves of gentle bees near the narrow Isthmus of Panama. But would Panama permit it? Also, would European bees prove effective competitors in the tropical wilds? Dr. Taylor, for one, believes that the bees have a chance of reaching the United States relatively unchanged.

What then? The Brazilian experience proves that the bees' aggressiveness can be tempered. Whether this happens in Mexico or the United States, it will take at least several years of interbreeding and sophisticated bee-keeping. No one knows how much North America's cooler climate will mollify the bees.

Honeybees and their relatives already kill





twice as many people in the United States as do venomous snakes. In most cases the deaths are allergic reactions, often to a single sting. Nonetheless it must be stressed that no honeybee stings except in defense of itself or its hive. The African instinct is simply to overreact to disturbances anywhere near the hive. So the nervous African genes would result in more accidental deaths, but certainly no widespread menace.

The new bees could have a less sensational, but potentially severe impact on agriculture. Honeybees account for about 80 percent of insect pollination in the U.S. They affect 90 major crops, including alfalfa, the primary feed of the livestock and dairy industries. With the honeybee's value estimated as high as six billion dollars a year, the invaders must not be attacked with pesticides.

"If you wipe out bees, the production of many important fruits and vegetables would be seriously reduced," said Marshall Levin of the U.S. Department of Agriculture.

Pesticides and the dwindling of open space have already put bees in such short supply that commercial beekeepers now sell pollination services. They cart truckloads of hives from one flowering crop to the next.

"If our honeybees become at all like the

ones in Brazil, it will be a catastrophe," John Allred, a California beekeeper, predicted. "We beekeepers could gear up to handle them, but the irrigators, harvesters, and tractor drivers—the people who have to work in the fields—would have an awful time."

An aggressive bee would force many of the country's 200,000 amateur beekeepers to drop their hobby. "People who play with bees are not going to work with wild beasts," said Marshall Levin.

Bee experts seem more concerned about other African traits, which hybridizing apparently has not altered. For one thing, while the African hybrids work in far cooler temperatures than European bees, they cannot cope with a hard winter. The Europeans cluster into a ball, and by constant movement keep their temperature at 96° F., thus surviving extreme cold.

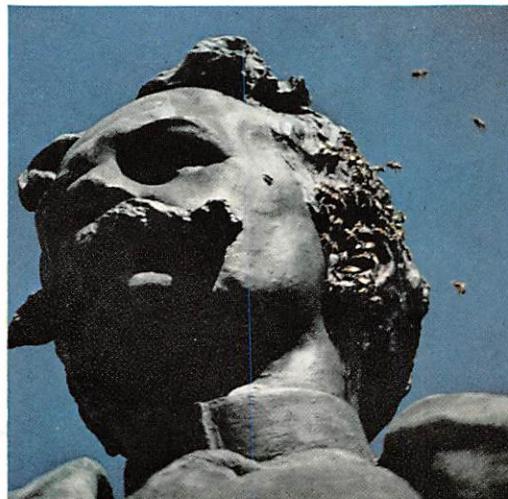
Bee Threat to U.S. Remains Uncertain

This inability to winter over will confine the natural spread of the African genes to warmer regions: in the East as far north as Charleston, for example, and in California north to San Francisco. However, these areas house the bulk of the bee-breeding industry, which every spring sends bees to the North and Canada. Africanized bees could devastate this industry because few Northerners would order aggressive bees that cannot survive the winter.

The migratory nature and excessive swarming of the nervous African hybrids also concern bee scientists. When colonies swarm frequently, they stay small. Beekeepers, particularly those who truck their hives around to pollinate crops, might have trouble keeping Africanized hybrids; absconding bees would create more wild colonies, and thus more stinging accidents.

Such problems are today only guesswork. Indeed some scientists say it is folly to speculate, that nature will somehow intervene to thwart the bees' advance.

But having been attacked for more than two hours by these bees, I have great respect for their persistence. As for changing their nature, I recall what Dr. Norman Gary of the University of California at Davis told me: "We don't understand aggression in our own species. How much less we know about it in this little insect!" □



Humming with life, a statue at the town of Recife (above) harbors bees that bother no one, perhaps due to the height of their nest. Demand for honey encourages hive hunter Francisco da Costa (left), who endures numerous stings to gather the wild product that he bottles and sells.

Water Dwellers in a

